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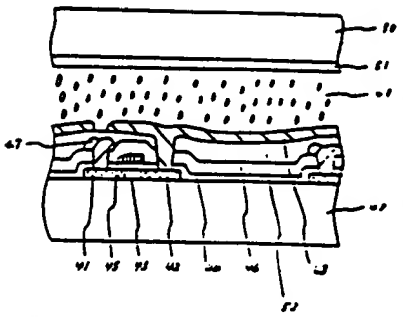
(54) DISPLAY DEVICE
(11) 1-156725 (A) (43) 20.6.1989 (19) JP
(21) Appl. No. 62-316708 (22) 15.12.1987
(71) SEIKO EPSON CORP (72) YOJIRO MATSUEDA
(51) Int. Cl⁴. G02F1/133,G09G3/36

WITH FULL TRANSLATION

PURPOSE: To improve the quality of an image by arranging picture element electrodes on an insulating film which covers at least part of an active element and wiring.

CONSTITUTION: There is the insulating film on the element and there are picture element electrodes 4 on it, so thin film transistor TETs 41, 42, 43, and 45 and a data line 47 are covered with the electrode 48. Liquid crystal 49 is driven with an electric field between a counter electrode 51 and the electrode 48. The electrode 48 is formed of a transparent conductive film and polarizing plates are arranged on and under insulating substrates 40 and 50 to form the transmission type display device; when the gap between electrodes 48 is positioned right on the line 47 and a scanning line, wiring operates as a light shield layer and light transmitted through other parts is used effectively to obtain a bright picture with a high contrast ratio, thereby obtaining the excellent image quality.



349/138

⑲日本国特許庁(JP)　⑪特許出願公開

⑫公開特許公報(A)　平1-156725

⑤Int.Cl.⁴		識別記号	庁内整理番号	⑬公開　平成1年(1989)6月20日
G 02 F	1/133	327	7370-2H	
G 09 G	3/36		8621-5C	

審査請求　未請求　発明の数 1　(全5頁)

⑭発明の名称　表示装置

⑪特　願　昭62-316708
⑫出　願　昭62(1987)12月15日

⑰発明者　松枝　洋二郎　長野県諏訪市大和3丁目3番5号　セイコーエプソン株式会社内
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明　細　書

1．発明の名称

表示装置

2．特許請求の範囲

(1)第1の絶縁基板上に2次元の能動素子アレイと、前記能動素子に信号を供給する配線と、前記各能動素子に接続された画素電極とを備え、第2の絶縁基板上には対向電極を備え、第1及び第2の絶縁基板を対向させて成る間隙に電気光学材料を封入して成る表示装置において、前記能動素子及び配線上の少なくとも一部を覆う絶縁膜を備え、前記絶縁膜上に画素電極を配置したことを特徴とする表示装置。

(2)前記画素電極は、各画素電極間の間隙の少なくとも一部が前記配線上に位置するように配置されたことを特徴とする特許請求の範囲第1項記載の表示装置。

(3)前記能動素子及び配線上を覆う絶縁膜の厚みは、前記能動素子及び配線上では厚く、その他の部分では薄く形成されていることを特徴とする特許請求の範囲第1項記載の表示装置。

(4)前記画素電極が金属薄膜で形成されていることを特徴とする特許請求の範囲第1項記載の表示装置。

3．発明の詳細な説明

〔産業上の利用分野〕

本発明は、表示装置の構造に関する。

〔従来の技術〕

従来の電気光学材料を用いた表示装置の例としては、「日経エレクトロニクス　1984年9月10日号　No.351　P.211-240」に示されるようなものがある。第2図は表示装置の平面図の例であり、データ線12と走査線13の交点に薄膜トランジスタすなわちTFT14が配置され、各TFTには画素電極11が接続されている。第3図は断面図の例であり、20及び30は絶縁基板、21、22、23はそれぞれTF

Tのソース部、ドレイン部、チャネル部、24はゲート絶縁膜、25はゲート電極である。26は層間絶縁膜、27はデータ線、28は画素電極、31は対向電極で、2つの基板間に封入された液晶等の電気光学材料29は、画素電極28と対向電極31との間の電界で駆動される。

〔発明が解決しようとする問題点〕

しかし、前述の従来技術は以下に述べるような問題点を有する。すなわち、表示装置の画面の高精細化を実現しようとする場合、画素面積を小さくする必要があるが、一般に能動素子や配線部の面積を小さくするのは困難であり、画素電極のしめる面積の割合が減少する。画像を表示することができるのは画素電極領域のみであるから、その割合が減少するとコントラスト比が小さくなり画位が著しく損われる。コントラスト比を大きくするためには、画素電極以外の部分を遮光すればよいが、画面が暗くなってしまう。

本発明はこのような問題点を解決するものであり、その目的とするところは、画素を高密度化してもコントラスト比が小さくなったり画面が暗くなったりしないような表示装置を実現するところにある。

〔問題点を解決するための手段〕

本発明の表示装置は、能動素子及び配線上の少なくとも一部を覆う絶縁膜を備え、前記絶縁膜上に画素電極を配置したことを特徴とする。

〔作　用〕

本発明の上記の構成によれば、画素を高密度化しても画素電極のしめる面積の割合はほとんど変わらない。従ってコントラスト比が小さくなったり画面が暗くなったりしない。

〔実施例1〕

本発明の表示装置の1実施例における平面図を第1図に、断面図を第4図に示す。本実施例では能動素子としてTFTを用い、電気光学材料として液晶を用いる。この表示装置は第1図のように、データ線2と走査線3、及びそれらの交点に設けられたTFT4と画素電極1とから成る。TFTのソース電極はデータ線2に、ゲート電極は走査線3に、ドレイン電極は画素電極1に接続され、TFTは走査線のタイミングに応じてデータ線の信号を画素電極に与えるスイッチング素子として用いられる。第4図において、40は絶縁基板、41、42、43、45はそれぞれTFTのソース部、チャネル部、ドレイン部、ゲート電極であり、44はゲート絶縁膜である。46は層間絶縁膜で、47はデータ線である。本実施例においては、これらの素子の上にもう一層の絶縁層52があり、その上に画素電極48を形成するため、TFTの上部やデータ線の上部も画素電極で覆うことができる。50はもう一つの絶縁基板で51は透明導電膜から成る対向電極、49は液晶である。液晶49は対向電極51と画素電極48の間の電界で駆動される。画素電極48を透明導電膜を用いて形成し、2つの絶縁基板の上下に偏光板を配置すると、透過型の表示装置となるが、第1図の様に画素電極どうしの間隙がちょうどデータ線と走査線上にくるようにすれば、これらの配線が遮光膜として働き、それ以外の部分を透過する光は有効に使えるため、高コントラスト比で明るい画面を得ることができる。一方、絶縁膜52の材料としてポリイミドやガラス等を用い、塗状で塗布し表面を平坦化した上で、画素電極48にアルミニウムや金、プラチナ等の金属を用いると反射型の表示装置となる。反射型の場合には各TFT間の間隔を大きくする必要がないため極めて高精細な画像を得ることができる。反射型の表示装置であればシリコン基板を用いることもできるが、大画面の画像を表示する場合、配線の寄生容量が大きいため適していない。大画面で高精細の画像を得るには絶縁基板を用いる必要がある。また、反射型では表示品質を向上させるために各画素に保持容量を作り込んでも画面の明るさは変わらない。例えばMOS容量等を用いて液晶の数～数十倍の容量を付加することができる。これによって、非常に広い温度範囲で高コントラスト比で面内均一性の良い画像を再現性良く　ることができる。この様な表示装置の応用例としては投射型表示装置等がある。　発明の表示装置は薄型で高精細かつ

高品質の画像を表示できるためこれを透過型または反射型のライトバルブとして用いると小型の装置で高品質かつ大画面の画像を表示できる投射型表示装置が実現できる。

〔実施例2〕

第5図は、第1の実施例と異なる構造のTFTを用いた表示装置の断面図の例である。本実施例においてはゲート電極45がチャネル部の下側にあるため、ゲート絶縁膜44が層間絶縁膜の代わりとなる。第4図と比較すると絶縁膜が一層少なくなっている。この他な構造のTFTでも第1の実施例と同様に絶縁膜52を形成した後画素電極48を形成することにより同様の画像を得ることができる。

〔実施例3〕

第6図は本発明の第3の実施例を示す表示装置の断面図の例である。この例では能動素子としてTFTの代わりに2端子型非線形抵抗素子を用いる。2端子素子を用いる場合、第1の絶縁基板60上には配線は走査線65のみで、第2の絶縁基板70上の対向電極71がストライプ状になっておりデータ線の代わりとなる。2端子素子はTFTに比べると構造が単純で、たとえばMIMダイオードの場合、金属電極62と金属から成る走査線65の間に絶縁膜64をはさみその非線型抵抗を利用する。その他の2端子素子の例としてはダイオードリング、pinダイオードMSIダイオード等がある。いずれにしてもこれらの素子上に絶縁膜72を設け、その上に画素電極68を設け、画素電極間の間隙が走査線の上にくるようにすれば、高精細化しても高コントラスト比で明るい画像が得られる。また、金属の画素電極を形成すれば反射型の表示装置も実現できる。

〔発明の効果〕

以上述べたように本発明の表示装置は、画素電極の占有面積を最大にすることができるため、画素を高密度化しても画面が暗くならない。しかも、配線が遮光膜として働くためコントラスト比も大きくとれる。さらに、液晶等の電気光学材料に接する表面には画素電極と対向電極のみが配置され、他の配線は絶縁膜の下にあるため、電気光学材料には必要な信号電圧のみが印加される。したがって画素のすみずみまで透過率または反射率が一様となり高品質の画像が得られ、電気光学材料の信頼性も向上する。

一方、反射型の表示装置として用いる場合には保持容量を付加することにより高精細かつ高コントラスト比で画内均一性の極めて良い画像を、広い温度範囲で再現性良く得ることができる。また、能動素子の寄生容量によってスイッチング時に生じるオフセット電圧もほとんどなくなるため、フリッカーがなくなり電気光学材料の信頼性も一段と向上する。

4．図面の簡単な説明

第1図は表示装置の平面図。

第2図は従来の表示装置の平面図。

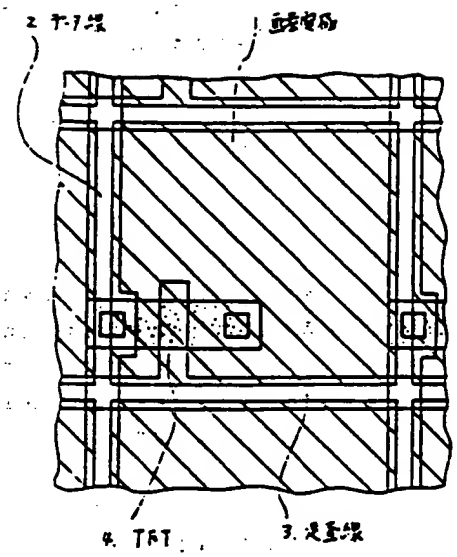
第3図は従来の表示装置の断面図。

第4、5、6図は表示装置の断面図。

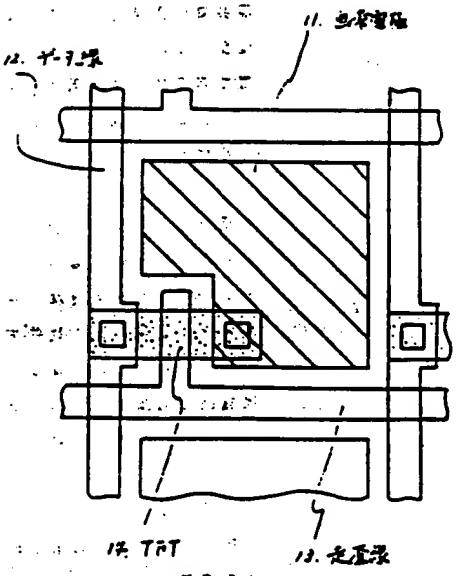
1、11、28、49、68・・・画素電極
52、72・・・・・・・・・・絶縁膜
2、12・・・・・・・・・・・データ線
3、13・・・・・・・・・・・走査線

以上

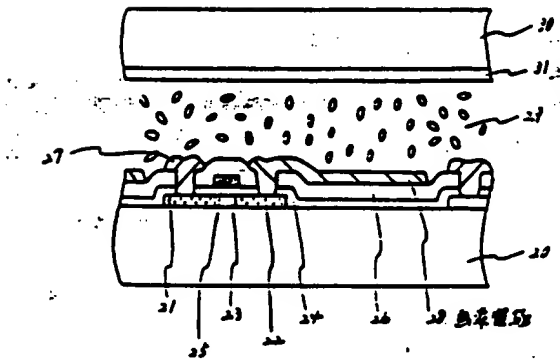
出願人　セイコーエプソン株式会社
代理人　弁理士　最上　務（他1名）



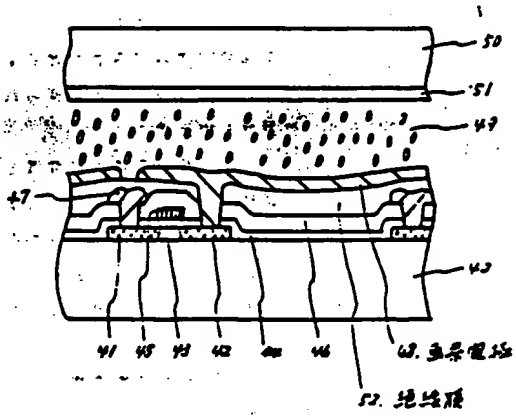
第 1 図



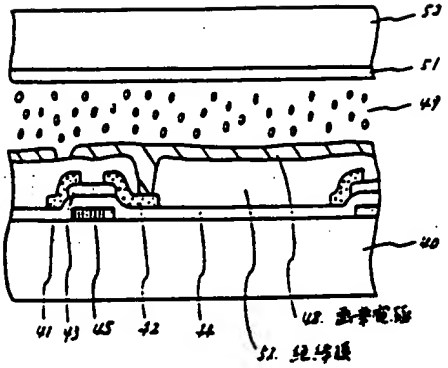
第 2 図



第 3 図



第 4 図


53
51
49
40
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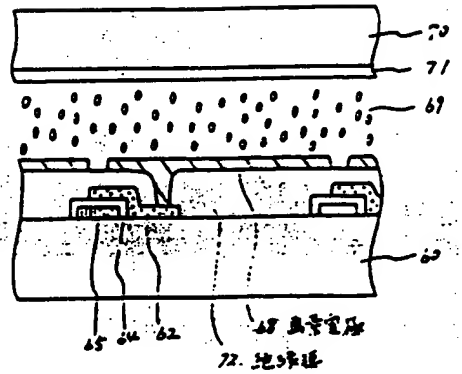
44
48. 画素電極
52. 絶縁膜

第5図


70
71
69
60
65
64
62
68. 画素電極
72. 絶縁膜

第6図

Translation of JP 1-156725 6/20/90

Specification

1. Title of the invention Display device

2. What is claimed is:

(1) A display device comprising:

a two dimensional active elements array, wirings which provide said active elements with signals, and pixel electrodes connected to said active elements array formed on a first insulating substrate;

a counter electrode formed on a second insulating substrate; and

an electro-optical material disposed in a gap between said first and second substrates facing each other;

wherein said active elements and said wirings are covered with an insulating film at least partly, and the pixel electrodes are provided on said insulating film.

(2) The display device of claim 1 wherein said pixel electrodes are arranged such that at least a part of a gap between said pixel electrodes is located over said wirings.

(3) The display device of claim 1 wherein a thickness of said insulating film which covers said active elements and wirings is small on said active elements and wirings, and large on other portions.

(4) The display device of claim 1 wherein said pixel electrodes are formed with a metal thin film.

3. Detailed description of the invention

[FIELD OF THE INVENTION]

The present invention relates to a structure of a display device.

[DESCRIPTION OF THE PRIOR ART]

An example of conventional display device using electro-optical material is shown in Nikkei Electronics, September 10, 1984, No. 351, P. 211-240. Fig. 2 shows an example of plan view of the display device.

In Fig. 2, a thin film transistor, that is TFT 14 is arranged on intersection of data line 12 and scanning line 13, and pixel electrode 11 is connected each TFT. In Fig. 3 which shows an example of cross section, reference numerals 20 and 30 show insulating substrates, reference numerals 21, 22, and 23 show a source portion, a drain portion, and a channel portion, respectively. Reference numeral 24 shows a gate insulating film, 25 shows a gate electrode, 26 shows an interlayer insulating film, 27 shows a data line, 28 shows a pixel electrode, and 31 shows a counter electrode. An electro-optical material 29 such as liquid crystal, which is disposed between two substrates, is driven by an electric field between the pixel electrode 28 and the counter electrode 31.

[PROBLEMS THE PRESENT INVENTION INTENDS TO SOLVE]

However, the above mentioned prior art has following problems. That is, it is necessary to reduce the area of pixel if the prior art intends to realize high definition of display portion of the display device. However, it is usually difficult to reduce the area of active elements and wiring portion, and the area proportion that the pixel electrodes occupy decreases. It is only pixel electrode region that image could be displayed thereon. Therefore, if the ratio of the pixel electrodes decreases, the contrast ratio decreases and an image quality is extremely damaged. In order to increase the contrast ratio, other than pixel electrode portion may be intercepted from light, however, the display portion is dark.

The present invention intends to solve the problem. An object of the present invention is to realize a display device having a high contrast ratio and a brightness of display image even if high definition of device is realized.

[MEANS TO SOLVE THE PROBLEMS]

The display device of the present invention is characterized by an insulating film which covers at least a part of active elements and wirings, and arranges pixel electrodes thereon.

[EFFECT]

In accordance with the above mentioned structure of the present

invention, area proportion occupied by pixel electrodes is rarely changed by realization of high definition of pixel. Therefore, it does not happened that the contrast ratio decreases and display portion becomes dark.

[EXAMPLE 1]

Fig. 1 shows a plan view and Fig. 4 shows a cross section of Example 1 in accordance with a display device of the present invention. The present example uses TFTs as active elements and liquid crystal as an electro-optical material. The display device comprises data lines 2, scanning lines 3, and TFTs 4 and pixel electrodes 1 which are provided at the intersection between these lines. A source electrode of a TFT is connected with a data line 2, a gate electrode is connected with a scanning line 3, and a drain electrode is connected with a pixel electrode 1. The TFT is used as a switching element to provide the pixel electrode with a signal of the data line. In Fig. 4, reference numeral 40 shows an insulating substrate, 41, 42, 43, and 45 show source, channel, drain, gate portions of the TFT, respectively, 44 shows a gate insulating film, 46 shows an interlayer insulating film, and 47 shows a data line. In accordance with the present example, another layer of insulating film 52 is deposited on the device and pixel electrode 48 is formed thereon, therefore, it is possible to cover the upper portion of TFT and data line with the pixel electrode. Reference numeral 50 shows another insulating substrate, 51 shows a counter electrode comprising a transparent conductive film, 49 shows liquid crystal. The Liquid crystal 49 is driven between the counter electrode 51 and the pixel electrode 48. The pixel electrode 48 is formed by using a transparent conductive film and a polarizing plates are arranged over and under the two insulating substrates to form a transmission display device. As the same with the first time, when the pixel electrode is arranged on the data line and scanning line, these wirings work as a light shielding layer and light which transmits through other part can be used effectively to realize display device having high contrast and bright display portion. On the other hand, a reflection type display device is made when a metal such as aluminum, gold, or platinum is used as the pixel electrode 48 by using polyimide or glass as an insulating film 52 and providing a planarized upper surface by coating in a liquid phase. In case that reflection type

is used, it is no need to increase space between TFTs, therefore, it is possible to realize a display having extremely high definition. A silicon substrate also can be used for a reflective display device, however, if image is displayed on large area, it is not appropriate because of large parasitic capacity of wirings. It is necessary to use an insulating substrate in order to obtain wide vision having high definition picture. Moreover, brightness of image does not change even if each pixel has a holding capacitor in order to improve the projection type display device. For example, it is possible to add capacitor of several to several ten times as much as liquid crystal by using MOS capacity or the like. In this way, an image having a high contrast over a very wide temperature range and a high uniformity over the display can be obtained with a high reproducibility. An applied example of the display device is a projection type display device or the like. The display device of the present invention is a thin type and can display an image of high definition and high quality. Therefore, if the display device is used as a light valve of a transmission type or reflection type, it is possible to obtain projection type display device which is thin type and can display image of high definition on a wide vision.

[Example 2]

Fig. 5 shows a cross section of a display device using another TFT having a different structure from one of Example 1. In accordance with the present example, a gate electrode 45 is under a channel portion, therefore, a gate insulating film 44 can be replaced with an interlayer insulating film. Compared with Fig. 4, one insulating layer is omitted. It is possible to obtain same image by forming a pixel electrode 48 after forming an insulating film 52 in a similar way of Example 1.

[Example 3]

Fig. 6 shows a cross section of a display device in accordance with the Example 3 of the present invention. In the example, a two terminal non-linear resistance element is used as an active element instead of the TFT. In case that two terminal element is used, only scanning line 65 is used as wirings on the first insulating substrate 60 and counter electrode 71 formed on the second insulating substrate 70 is in the state of stripe, therefore, it can be used instead of data line. Compared with

TFT, two terminal element has a simple structure, for example, when a MIM diode is used as the two terminal element, an insulating film 64 is disposed between a metal electrode 62 and scanning line 65 comprising metal to utilize non-linear resistance. As another example of a two terminal element, a diode ring, nin diode MSI diode or the like. In any way, if an insulating film 72 is formed on the element, and a pixel electrode is formed thereon in order to arrange space between the pixel electrodes on a scanning line, it is possible to obtain brightness of the image having a high contrast even in the case of a high definition.

[THE EFFECT OF THE INVENTION]

As mentioned above, in accordance with the display device of the present invention, the area occupied by pixel electrodes can be maximized, therefore, even if the pixels are high density, picture portion is not dark. Moreover, wirings work as a light shielding layer, therefore, it is possible to obtain high contrast ratio. Further, only pixel electrodes and counter electrodes are arranged on a surface contacted with electro-optical material such as liquid crystal and other wirings are arranged under an insulating film. Therefore, necessary signal voltage is applied on the electro-optical material. As a result, transmission and reflectance of all pixels are same, and confidence of electro-optical material is improved.

On the other hand, in case that the display device is used as a reflective type, fine image having a high contrast over a very wide temperature range and a high uniformity over the display device can be obtained by adding a holding capacitor. Also, since the offset voltage which occurs due to the parasitic capacitance of the active elements during switching almost disappears, the flicker does not occur and the reliability of the electro-optical material is further increased.

[BRIEF DESCRIPTION OF THE DRAWINGS]

Fig. 1 shows a plan view of a display device.
Fig. 2 shows a plan view of conventional display device.
Fig. 3 shows cross section of conventional display device.
Fig. 4, 5, and 6 show cross section of display device.

1, 11, 28, 48, 68 . . . pixel electrode

52, 72. . . . . insulating film
2, 12. . . . . data line
3, 13. . . . . scanning line

Translation of JP 1-156725 6/20/90

Specification

1. Title of the invention Display device

2. What is claimed is:

(1) A display device comprising:

a two dimensional active elements array, wirings which provide said active elements with signals, and pixel electrodes connected to said active elements array formed on a first insulating substrate;

a counter electrode formed on a second insulating substrate; and

an electro-optical material disposed in a gap between said first and second substrates facing each other;

wherein said active elements and said wirings are covered with an insulating film at least partly, and the pixel electrodes are provided on said insulating film.

(2) The display device of claim 1 wherein said pixel electrodes are arranged such that at least a part of a gap between said pixel electrodes is located over said wirings.

(3) The display device of claim 1 wherein a thickness of said insulating film which covers said active elements and wirings is small on said active elements and wirings, and large on other portions.

(4) The display device of claim 1 wherein said pixel electrodes are formed with a metal thin film.

3. Detailed description of the invention

[FIELD OF THE INVENTION]

The present invention relates to a structure of a display device.

[DESCRIPTION OF THE PRIOR ART]

An example of conventional display device using electro-optical material is shown in Nikkei Electronics, September 10, 1984, No. 351, P. 211-240. Fig. 2 shows an example of plan view of the display device.

In Fig. 2, a thin film transistor, that is TFT 14 is arranged on intersection of data line 12 and scanning line 13, and pixel electrode 11 is connected each TFT. In Fig. 3 which shows an example of cross section, reference numerals 20 and 30 show insulating substrates, reference numerals 21, 22, and 23 show a source portion, a drain portion, and a channel portion, respectively. Reference numeral 24 shows a gate insulating film, 25 shows a gate electrode, 26 shows an interlayer insulating film, 27 shows a data line, 28 shows a pixel electrode, and 31 shows a counter electrode. An electro-optical material 29 such as liquid crystal, which is disposed between two substrates, is driven by an electric field between the pixel electrode 28 and the counter electrode 31.

[PROBLEMS THE PRESENT INVENTION INTENDS TO SOLVE]

However, the above mentioned prior art has following problems. That is, it is necessary to reduce the area of pixel if the prior art intends to realize high definition of display portion of the display device. However, it is usually difficult to reduce the area of active elements and wiring portion, and the area proportion that the pixel electrodes occupy decreases. It is only pixel electrode region that image could be displayed thereon. Therefore, if the ratio of the pixel electrodes decreases, the contrast ratio decreases and an image quality is extremely damaged. In order to increase the contrast ratio, other than pixel electrode portion may be intercepted from light, however, the display portion is dark.

The present invention intends to solve the problem. An object of the present invention is to realize a display device having a high contrast ratio and a brightness of display image even if high definition of device is realized.

[MEANS TO SOLVE THE PROBLEMS]

The display device of the present invention is characterized by an insulating film which covers at least a part of active elements and wirings, and arranges pixel electrodes thereon.

[EFFECT]

In accordance with the above mentioned structure of the present

invention, area proportion occupied by pixel electrodes is rarely changed by realization of high definition of pixel. Therefore, it does not happened that the contrast ratio decreases and display portion becomes dark.

[EXAMPLE 1]

Fig. 1 shows a plan view and Fig. 4 shows a cross section of Example 1 in accordance with a display device of the present invention. The present example uses TFTs as active elements and liquid crystal as an electro-optical material. The display device comprises data lines 2, scanning lines 3, and TFTs 4 and pixel electrodes 1 which are provided at the intersection between these lines. A source electrode of a TFT is connected with a data line 2, a gate electrode is connected with a scanning line 3, and a drain electrode is connected with a pixel electrode 1. The TFT is used as a switching element to provide the pixel electrode with a signal of the data line. In Fig. 4, reference numeral 40 shows an insulating substrate, 41, 42, 43, and 45 show source, channel, drain, gate portions of the TFT, respectively, 44 shows a gate insulating film, 46 shows an interlayer insulating film, and 47 shows a data line. In accordance with the present example, another layer of insulating film 52 is deposited on the device and pixel electrode 48 is formed thereon, therefore, it is possible to cover the upper portion of TFT and data line with the pixel electrode. Reference numeral 50 shows another insulating substrate, 51 shows a counter electrode comprising a transparent conductive film, 49 shows liquid crystal. The Liquid crystal 49 is driven between the counter electrode 51 and the pixel electrode 48. The pixel electrode 48 is formed by using a transparent conductive film and a polarizing plates are arranged over and under the two insulating substrates to form a transmission display device. As the same with the first time, when the pixel electrode is arranged on the data line and scanning line, these wirings work as a light shielding layer and light which transmits through other part can be used effectively to realize display device having high contrast and bright display portion. On the other hand, a reflection type display device is made when a metal such as aluminum, gold, or platinum is used as the pixel electrode 48 by using polyimide or glass as an insulating film 52 and providing a planarized upper surface by coating in a liquid phase. In case that reflection type

is used, it is no need to increase space between TFTs, therefore, it is possible to realize a display having extremely high definition. A silicon substrate also can be used for a reflective display device, however, if image is displayed on large area, it is not appropriate because of large parasitic capacity of wirings. It is necessary to use an insulating substrate in order to obtain wide vision having high definition picture. Moreover, brightness of image does not change even if each pixel has a holding capacitor in order to improve the projection type display device. For example, it is possible to add capacitor of several to several ten times as much as liquid crystal by using MOS capacity or the like. In this way, an image having a high contrast over a very wide temperature range and a high uniformity over the display can be obtained with a high reproducibility. An applied example of the display device is a projection type display device or the like. The display device of the present invention is a thin type and can display an image of high definition and high quality. Therefore, if the display device is used as a light valve of a transmission type or reflection type, it is possible to obtain projection type display device which is thin type and can display image of high definition on a wide vision.

[Example 2]

Fig. 5 shows a cross section of a display device using another TFT having a different structure from one of Example 1. In accordance with the present example, a gate electrode 45 is under a channel portion, therefore, a gate insulating film 44 can be replaced with an interlayer insulating film. Compared with Fig. 4, one insulating layer is omitted. It is possible to obtain same image by forming a pixel electrode 48 after forming an insulating film 52 in a similar way of Example 1.

[Example 3]

Fig. 6 shows a cross section of a display device in accordance with the Example 3 of the present invention. In the example, a two terminal non-linear resistance element is used as an active element instead of the TFT. In case that two terminal element is used, only scanning line 65 is used as wirings on the first insulating substrate 60 and counter electrode 71 formed on the second insulating substrate 70 is in the state of stripe, therefore, it can be used instead of data line. Compared with

TFT, two terminal element has a simple structure, for example, when a MIM diode is used as the two terminal element, an insulating film 64 is disposed between a metal electrode 62 and scanning line 65 comprising metal to utilize non-linear resistance. As another example of a two terminal element, a diode ring, nin diode MSI diode or the like. In any way, if an insulating film 72 is formed on the element, and a pixel electrode is formed thereon in order to arrange space between the pixel electrodes on a scanning line, it is possible to obtain brightness of the image having a high contrast even in the case of a high definition.

[THE EFFECT OF THE INVENTION]

As mentioned above, in accordance with the display device of the present invention, the area occupied by pixel electrodes can be maximized, therefore, even if the pixels are high density, picture portion is not dark. Moreover, wirings work as a light shielding layer, therefore, it is possible to obtain high contrast ratio. Further, only pixel electrodes and counter electrodes are arranged on a surface contacted with electro-optical material such as liquid crystal and other wirings are arranged under an insulating film. Therefore, necessary signal voltage is applied on the electro-optical material. As a result, transmission and reflectance of all pixels are same, and confidence of electro-optical material is improved.

On the other hand, in case that the display device is used as a reflective type, fine image having a high contrast over a very wide temperature range and a high uniformity over the display device can be obtained by adding a holding capacitor. Also, since the offset voltage which occurs due to the parasitic capacitance of the active elements during switching almost disappears, the flicker does not occur and the reliability of the electro-optical material is further increased.

[BRIEF DESCRIPTION OF THE DRAWINGS]

Fig. 1 shows a plan view of a display device.
Fig. 2 shows a plan view of conventional display device.
Fig. 3 shows cross section of conventional display device.
Fig. 4, 5, and 6 show cross section of display device.

1, 11, 28, 48, 68 . . . pixel electrode

52, 72. . . . . insulating film
2, 12. . . . . data line
3, 13. . . . . scanning line